BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Study

Region: Pacific

Planning Area(s): Southern California, Central California, Northern California, Washington-Oregon

Title: Data Synthesis and High-resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS (PC-15-01)

BOEM Information Need(s) to be Addressed: Experience from onshore wind development and wind development offshore in Europe suggests that siting of facilities is an important consideration for minimizing impacts to bird species. Presently, there are extensive seabird databases for the Pacific OCS that provide relative density estimates and distributions at sea along survey transects. However, species-specific estimates of distribution, relative abundance, and occurrence probability can be improved and extended to areas between transects or in non-surveyed areas by incorporating appropriate environmental and oceanographic covariates to model continuous density distributions. The resulting high-resolution maps of predicted long-term average patterns of seabird occurrence and abundance will provide critical information for renewable energy siting and allow BOEM to predict and evaluate potential environmental effects of management actions and project approvals throughout the Pacific OCS.

Total BOEM Cost: $600,000 **Period of Performance:** FY 2015-2019

Conducting Organizations: National Oceanic and Atmospheric Administration and U.S. Geological Survey

Principal Investigators: Brian Kinlan (NOAA) and Dr. Josh Adams (USGS)

BOEM Contact: David Pereksta

Description:
Background: This study will provide detailed information linking varying environmental and oceanographic conditions to seabirds within the Pacific OCS and will help define habitat characteristics and identify mechanisms that aggregate seabirds. Thus, this study will use the most recent seabird distributional datasets, combined with oceanographic habitat features in analytical models, to predict occurrence and abundance of seabirds at sea.

Maps of seabird distribution and uncertainty in knowledge of distribution are a basic information need to assess impacts of offshore development on marine birds. Discussions during the USFWS Marine Bird Science and Offshore Wind Workshop and the BOEM Wind Energy Workshop in 2011 emphasized the importance of identifying areas of persistent aggregations of birds (“hotspots”) that may be threatened by offshore wind energy development as well as areas where birds do not aggregate (“coldspots”).

Sampling of the marine environment is difficult due to weather and other logistics; therefore, approaches such as predictive population modeling have been recommended to aid agencies in assessing the potential impacts of development on wildlife. Other modeling efforts have been conducted in this region, but the only full regional-scale effort (Nur, et al., 2011) was limited in spatial resolution (3-10 km), depending on environmental predictors used; coarser than the BOEM lease block scale), only produced useable results for a small subset of species, and did not provide a spatially explicit assessment of model uncertainty or model performance, limiting its applicability in risk assessment. Moreover, since the time of this study, higher resolution oceanographic datasets have become widely available (e.g., chlorophyll and sea surface temperature at 1.1 km resolution), new descriptions of ocean habitat features have been found to vastly improve predictions of seabird abundance (e.g., Suryan, Santora and Sydeman, 2012), and new seabird survey data have been collected. On the Atlantic OCS, predictive models of seabird occurrence and abundance developed by NOAA's National Centers for Coastal Ocean Science have been successfully developed at <1 km resolution, with associated maps of uncertainty, and have already proven useful in BOEM's environmental assessment processes (Kinlan, Menza and Huettmann, 2012).

Objectives: Increase BOEM's understanding of marine bird distribution on the Pacific OCS by (1) predictively modeling marine bird distribution on the Pacific OCS, taking into account all available data and relationships with environmental variables; and (2) mapping the predictive distribution of marine birds to identify areas of persistent aggregation and avoidance.

Methods:
This study will identify, collect, and synthesize available quantitative scientific seabird survey data for the Pacific OCS off California, Oregon, and Washington collected over the last 50 years and merge these in a common database. This will entail researching the history of datasets, making appropriate contacts, forming partnerships, and developing metadata. Sightings will be extracted from databases by species to identify species and groups of interest, combine species into functional groups where necessary, develop standardized effort metrics and relative indices of occurrence and abundance, and develop dataset and taxa-specific uncertainty estimates/weights. Five major seabird datasets from the Pacific OCS have already been identified for use in this study. Environmental and oceanographic predictors will be identified, collected, formatted, and processed for the Pacific OCS. Exploratory data analysis will be conducted and modeling methods chosen that account for multiple datasets with different levels of confidence and measurement error; account for different spatial and temporal support; and adapt existing methods that have been successfully applied in other regions. Model methods will be refined to maximize predictive performance for the Pacific OCS.

Predictive modeling will produce gridded, high-resolution (~1 km horizontal grid) predictive maps of presence probability and sightings per unit effort (SPUE) for bird species and groups of interest, including maps of seasonal climatological means and quantiles that are integrated to produce annual climatologies and uncertainty maps. Model predictions will be provided for presence probability and SPUE within BOEM lease blocks or similar sets of polygonal planning areas provided by planning bodies by performing spatial simulation and calculating ensemble statistics for each lease block. Predictive maps will be combined across species and groups to identify hotspots and coldspots of abundance and diversity and/or occurrence of multi-species assemblages of interest with a limited, targeted effort based on guidance from BOEM, USFWS, USGS, and other interested parties on multi-species patterns of interest. Reports and data, including digital versions of predictive maps and uncertainty, will be in a format that is compatible with the BOEM Marine Cadastre and similar BOEM datasets.

Current Status: The BOEM-USGS intra-agency agreement was awarded on June 18, 2015. The BOEM-NOAA interagency agreement was awarded on August 3, 2015. NOAA and USGS have started collaborating on the acquisition and review of at-sea bird distribution datasets.

Final Reports Due: 2018

Publications Completed: None

Affiliated WWW Sites: None

Revised Date: July 27, 2016

References:

Kinlan, B.P., C. Menza, and F. Huettmann. 2012. Predictive modeling of seabird distribution patterns in the New York Bight. Chap. 6 *in* A biogeographic assessment of seabirds, deep sea corals and ocean habitats of the New York Bight: science to support offshore spatial planning, edited by C. Menza, B.P. Kinlan, D.S. Dorfman, M. Poti and C. Caldow. Silver Spring, MD: National Oceanic and Atmospheric Administration, NOAA Technical Memorandum NOS NCCOS 141, 224 pp.

Nur, N., et al. 2011. Where the wild things are: predicting hotspots of seabird aggregations in the California Current System. Ecological Applications 21, no. 6: 2241-2257.

Suryan, R.M., J.A. Santora, and W.J. Sydeman. 2012. New approach for using remotely sensed chlorophyll a to identify seabird hotspots. Marine Ecology Progress Series 451: 213-225.